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ABSTRACT

A maintenance management system is provided for automated indication of prioritised maintenance services for assets of an organisation. The system comprises input means for entering data relating to a set of characteristics of the assets, data storage means for storing the entered data, processing means adapted for processing selected data in said storage means to provide a listing of maintenance services for the assets in accordance with a priority determining arrangement. The listing may have a prioritised list of maintenance based on calculated rankings of maintenance services and condition index of elements of the assets.

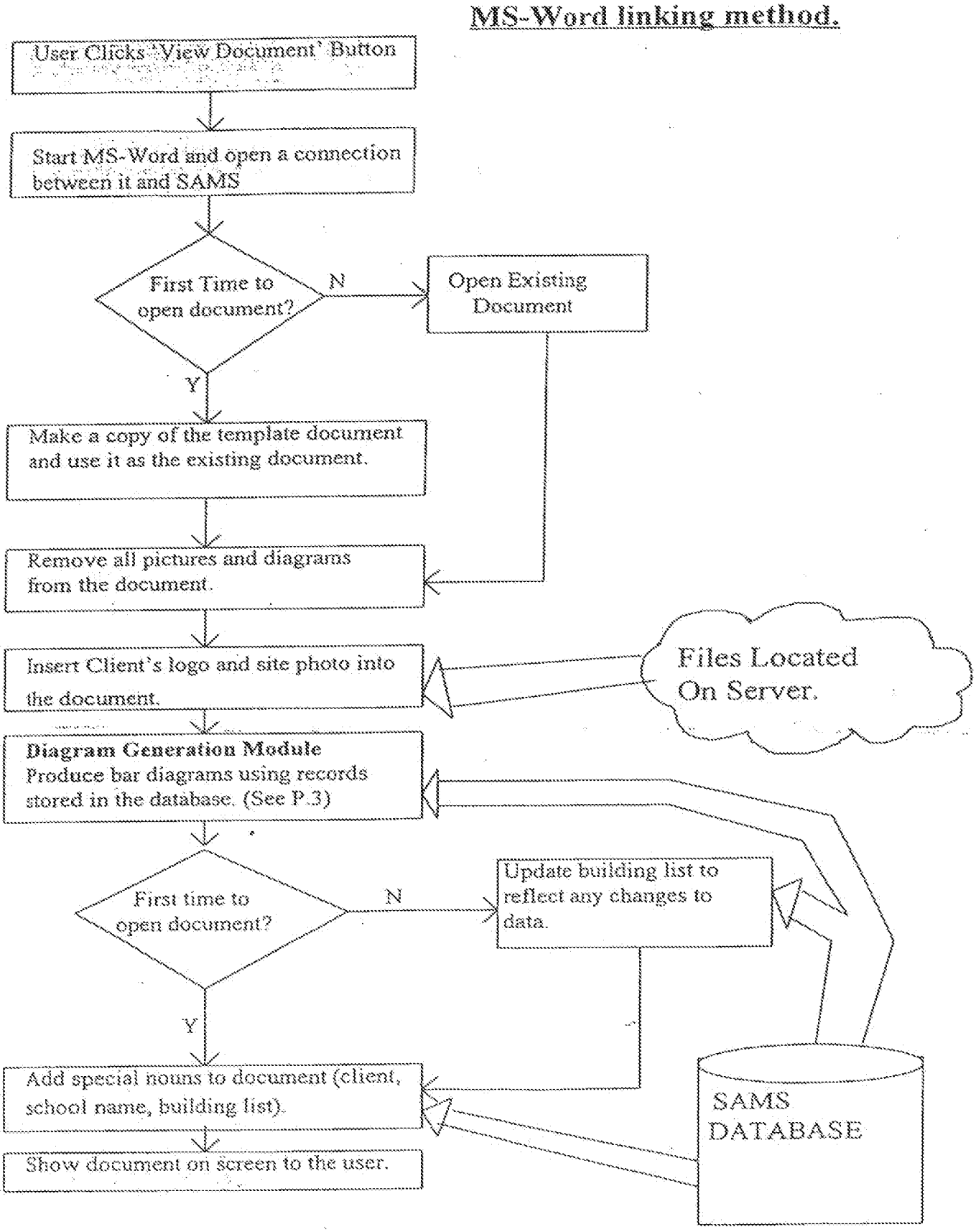
MS-Word linking method.
User Clicks 'View Document' Button
Start MS-Word and open a connection between it and SAMS
First Time to open document?
N
Open Existing Document
Y
Make a copy of the template document and use it as the existing document.
Remove all pictures and diagrams from the document.
Insert Client's logo and site photo into the document.
Files Located On Server.
Diagram Generation Module
Produce bar diagrams using records stored in the database. (See P.3)
First time to open document?
N
Update building list to reflect any changes to data.
Y
Add special nouns to document (client, school name, building list).
Show document on screen to the user.
SAMS DATABASE

FIG 9

P/00/011
Regulation 3.2

AUSTRALIA

Patents Act 1990

COMPLETE SPECIFICATION FOR A STANDARD PATENT

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Invention Title:	ASSET MAINTENANCE MANAGEMENT SYSTEMS
Details of Associated Provisional Application(s) No(s):	Australian Patent Application No. PQ4869 filed 23 December 1999.

The following statement is a full description of this invention, including the best method of performing it known to me:

ASSET MAINTENANCE MANAGEMENT SYSTEM

TECHNICAL FIELD OF THE INVENTION

THIS INVENTION relates to a maintenance management system for assets and in particular but not limited to a maintenance management system for buildings wherein maintenance services required for elements in the buildings are prioritised in a structural and systematic manner.

BACKGROUND ART

Many organisations such as Government departments and corporations have a large number of assets including buildings, vehicles, machinery, equipment and the like. Elements of the assets generally require maintenance services in order to keep them functioning at acceptable quality levels.

At present, in general, persons who use or are responsible for the assets of an organisation submit requests for maintenance services to a central body which is responsible for allocating maintenance services.

The needs or timings for maintenance services are based on personal judgement of the persons making the requests. They are therefore not structured and inconsistent.

Further the requests do not indicate asset usage and long term strategic planning for the assets.

The central body accordingly cannot process the requests for services in a systematic manner and it is not possible to generate a reliable priority listing of maintenance services.

Over the life cycle of an asset, maintenance costs usually outstrip the original capital costs of the asset. It is therefore desirable to have an indication whether any of

the other alternatives such as refurbishing or acquiring a replacement asset instead of continuing maintenance is more cost effective in long term.

OBJECT OF THE PRESENT INVENTION

An object of the present invention is to provide a management system which alleviates or at least reduces to a certain level one or more of the prior art disadvantages.

OUTLINE OF THE INVENTION

In one aspect the present invention resides in a maintenance management system for one or more assets of an organisation. The system comprises input means for entering data relating to a set of characteristics of the one or more assets, data storage means for storing the entered data, processing means adapted for processing selected data in said storage means to provide a listing of maintenance services for the assets in accordance with a priority determining arrangement.

It is preferred that the listing includes a prioritised list of maintenance services for the or each asset. In one form the prioritised list of maintenance services is based on a maintenance ranking of calculated prioritisation maintenance services.

It is also preferred that the listing includes a list of asset conditions for the or each asset so that the assets requiring maintenance services can be identified. Typically a condition index is provided for indicating said list of asset conditions.

The list of asset conditions or condition index may be based on averaging weights allocated to elements or subordinate assets.

The or each asset may comprise a plurality of elements and the set of characteristics of the one or more assets includes characteristics of the elements in the or each asset.

Typically the element characteristics include asset usage data, element condition data, element performance data, risk exposure data and service effect data.

The list of building conditions or condition index can be provided by the processing means in accordance with the following example of the formula for the priority determining arrangement:

$$asset\ condition = \frac{\Sigma(X_n Y)}{n}$$

where X_n = condition data for element;

Y = asset usage data; and

n = number of elements

X_n may relate to one of 5 element condition ratings, namely:

Rating	Condition
1	Very poor
2	Poor
3	Normal
4	Good
5	Very good

Y may relate to one of 5 asset usage ratings, namely:

Rating	Usage
1	Disposal
2	Minimum use
3	Normal use

4 Prestige

5 Very prestige

Another example of the formula for the priority determining arrangement is given below:

In this example the processing means calculates a Condition Index for individual assets by averaging the aggregation of the weighted conditions of the asset's subordinate assets (in a hierarchical asset structure) that together comprise the asset.

In this context, the asset hierarchy is as follows:

Asset Class	**Examples**	**Sub-ordinate Assets**
Complex	School, Police Station, Hospital	Buildings
Building	Administration Block, Library, Classroom Block	Element Groups
Element Group	Electrical Services, Fire protection System	Elements
Element	Switchboard, Lighting,	N/A

Table 1 – Asset Hierarchy

Asset condition is both specified and assessed using the following general ratings:

Specified or Assessed Condition	Condition Description
5	Excellent
4	Good
3	Fair
2	Poor
1	Very Poor

Table 2 – Condition Descriptions

The weighting of each asset is represented as its criticality (i.e. its relative importance compared to other assets). Each asset is assigned an appropriate weighting from the following table.

Asset CRITICALITY	Weighting
Critical	10
Very High	9
High	8
Above Average	7
Average	6
Below Average	5
Low	4
Very Low	3

Table 3 – Asset Criticality Weightings

The generic method of calculating asset condition is:

Asset Condition = $\sum (W_{SA} \times C_{SA}) \ / \ \sum (W_{SA})$

Note, SA refers to Subordinate Asset

where W_{SA} is the criticality weighting of each subordinate asset

C_{SA} is the condition of each subordinate asset.

The prioritised list of maintenance services or maintenance ranking can be provided in accordance with the following example of the formula in the priority determining arrangement:

Prioritisation score = (A + B) * C

where A = risk exposure data;

B = service effect data; and

C = element performance data.

A may related to one of 5 scores, namely:

Score	Risk Type
60	Safety
40	Environment
30	Function of element
20	Financial costs
10	Other than the above

B may relate to one of 5 scores, namely:

Score	Service effect
50	Loss of service
40	Service disruption
30	Service nuisance
20	Minimal effect
10	No effect

C may relate to one of 5 scores, namely;

Score	Element performance
9	Failed
8	Faulty
7	Deteriorated
6	Serviceable
5	Good

Another example of the formula for calculating the prioritised list of maintenance services or maintenance ranking is described below:

In this example the processing means calculates a maintenance ranking for defects and their associated maintenance tasks (ie. maintenance repairs, replacements etc). This ranking is a value between 0 and 1000, which can be used when planning maintenance because it facilitates the prioritisation of tasks identified.

The higher the ranking, the higher the urgency or importance of the task identified. The ranking enables planned maintenance tasks to be prioritised over a 5 year time frame. For example, a task with a ranking of 800 or greater should be

carried out within 3 months of identification. A task with a ranking of 300 may not need to be carried out for approximately 3 years.

The *Maintenance Ranking (MR)* is calculated using an algorithm that takes into account the following:

- *Criticality* of the Element with the defect (W_{EL})
- *Criticality* of the Element Group with the defect (W_{EG})
- *Specified Condition* of the Element with the defect (SC)
- *Assessed Condition* of the Element with the defect (AC)
- *Risk Factor* relating to the potential impact of the defect (RF)
- Current *Business Operations Impact* of the defect (BOI)

Therefore **MR = f(W_{EL}, W_{EG}, SC, AC, RF, BOI)** **f = function**

In further detail, the algorithm is expressed as:

MR = 10 x √ { f(BOI, RF, SC, AC) x √(W_{EL} x W_{EG}) }

Where BOI (Business Operations Impact) selections are:

BOI	Value
Total loss of service	10
Major Disruptions	9
Interruptions	8
Minor Nuisance	7
Nil	6

Table 5 – Business Operations Impact (BOI) values

RF (Risk Factor) selections are:

RF	Values
Very High	20
High	18
Medium	16
Minimal	14
Nil	12

Table 6

SC (Specified Condition) selections are:

SC	Values
Excellent	5
Good	4
Fair	3
Poor	2
Very Poor	1

Table 7

AC (Assessed Condition) selections are:

AC	Values
Excellent	5
Good	4
Fair	3
Poor	2
Very Poor	1

Table 8.

The selections of possible criticality weightings for W_{SL} and W_{SO} are

Asset CRITICALITY	Weighting
Critical	10
Very High	9
High	8
Above Average	7
Average	6
Below Average	5
Low	4
Very Low	3

Table 9

The relationship f(BOI, RF, SC, AC) can be reduced to f(BOI, RF, ΔC) because ΔC is the difference between the Specified Condition (SC) and Assessed Condition (ΔC). The following relationship applies:

ΔC = (SC minus AC)	Value applied
5.00 – 2.01	5
2.00 – 0.01	4
0.00 - -2.00	3
-2.01 - -3.50	2
-3.51 - -5.00	1

Table 10

The relationship between the factors BOI and RF is also very important for this example. The values are represented on the axis in the following matrix (see table cc). The location of the corresponding junction point when these two are applied is also very important as it is located in a particular risk "zone", which in turn determines which multiplier will be to be used to represent the ΔC value applied above.

BOI Business Operations Impact

RF Risk Factor	Major (10)	Significant (9)	Interruptions (8)	Minor (7)	Nil (6)
Very High (20)	200	180	160	140	120
High (18)	180	162	144	126	108
Moderate (16)	160	144	128	112	96
Minimal (14)	140	126	112	98	84
Nil (12)	120	108	96	84	72

Table 11 – BOI and RF Matrix

The logic followed is that the higher the Business Operations Impact (BOI) and Risk Factors (RF), the higher the urgency of the task. This urgency is then further reinforced (or curtailed) by the difference between the Specified (SC) and Assessed Conditions (AC). The wider the gap (ie. condition shortfall) between Specified (SC) and Assessed Conditions (AC), the higher the level of reinforcement that the task is a high priority item.

Returning to the portion of the MR algorithm f(BOI, RF, ΔC). This can now be expressed as:

BOI x RF x f(ΔC)

f(ΔC) depends on where the BOI and RF factors meet in the above matrix. For easier explanation, the matrix can be broken into "zones" as follows.

RF Risk Factor	Major (10)	Significant (9)	Interruptions (8)	Minor (7)	Nil (6)
Very High (20)	A	A	A	A	A
High (18)	A	B	B	B	B
Moderate (16)	A	B	C	C	C
Minimal (14)	A	B	C	D	D
Nil (12)	A	B	C	D	E

Table 12

f(ΔC) is calculated using the following table:

	f(ΔC)				
ΔC Value *(see Table 10)*	**Zone A**	**Zone B**	**Zone C**	**Zone D**	**Zone E**
1	4	3.25	3	1.175	1
2	4.25	3.688	3.125	2.563	2
3	4.5	4.125	3.75	3.375	3
4	4.75	4.563	4.375	4.188	4
5	5	5	5	5	5

Table 13

This then provides the final factor used to calculate the Maintenance Ranking. Once the ranking is calculated, the following table is used to nominate an approximate time frame within which the work should be carried out. The time frame is added on to the assessment date and a "notional" work start date is estimated.

The following Table outlines the associated Time frames

Maintenance Ranking	**Timeframe**
>= 950	1 month
949 - 900	3 months
899 - 800	6 months
799 - 700	9 months
699 - 600	12 months
599- 550	18 months
549 - 500	22 months
499 - 450	24 months
449 - 400	30 months
399 - 300	36 months
299 - 250	42 months
249 - 200	48 months
199 - 100	54 months
<100	60 months

Table 14

The set of characteristic may also include maintenance cost data for the or each asset so that the system of the present invention can provide a table indicating the respective costs of the maintenance services.

It is also preferred that the set of characteristics includes capital cost data so that the system can provide a comparison of the maintenance costs and the capital costs.

More preferably the set of characteristics includes frequency of services data so that projected maintenance costs over a period of time can be provided.

Desirably the processing means is adapted to provide an asset condition index for the or each asset. The condition index can be determined according to the formula:

$$condition\ index = 1 - \frac{Maintenance\ cost}{Capital\ cost}$$

Preferably the condition index includes a first graphical representation of the asset condition in comparison with the asset conditions.

The condition index may also include a second graphical representation having indications of highest condition index, lowest condition index, means condition index and an indication of the relative position of the asset condition index.

If desired the processing means can be programmed to indicate a condition index over a time period for long term planning of the or each asset.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the present system of the present invention can be readily understood and put into practical effect the description will now refer to the following drawings which illustrate embodiments of the present invention, and wherein:-

Figure 1 is an asset register form for entering details of a complex according to one embodiment of the system according to the present invention;

Figure 2 is an asset register form for entering details of a building according to said one embodiment of the system;

Figure 3 is an asset module window of said one embodiment of the system of the present invention and the window allows selection of other modules of the system;

Figure 4 is a work order entry form in the work order module according to said one embodiment of the system;

Figure 5 is a historical work entry form in the historical work module according to said one embodiment of the system;

Figure 6 is an operation costs entry form in the operation costs module according to said one embodiment of the system;

Figure 7 is an element appraisal entry form in the condition appraisal module according to said one embodiment of the system;

Figure 8 is a task entry form for elements in a building according to said one embodiment of the system;

Figure 9 is a flow diagram showing a linking procedure between said one embodiment of the system of the present invention and an application programme;

Figure 10 is a diagram generation procedure for according to said one embodiment of the system;

Figure 11 to 13 show examples of the graphical condition index according to said one embodiment of the system;

Figure 14 is a table of buildings in a complex generated by the system according to said one embodiment of the present invention;

Figure 15 is a table of prioritised maintenance service for a year;

Figure 16 is a table of prioritised maintenance services for another year;

Figure 17 is a table of planned maintenance services over 10 years;

Figure 18 is a main menu of another embodiment of the system according to the present invention;

Figures 19 to 21 show forms for specifying conditions of assessment, reporting defects, and allocating tasks for an element in an asset, for said another embodiment of the system;

Figure 22 is a form for assessing and specifying conditions for a group of elements in an asset, for said another embodiment of the system;

Figure 23 is a form for assessing and specifying conditions for an asset, for said another embodiment of the system; and

Figure 24 is a form for assessing and specifying conditions for a group of assets, for said another embodiment of the system.

DETAILED DESCRIPTION OF THE DRAWINGS

The system according to said one embodiment of the system of the present invention includes 5 modules, namely asset register module, work orders module, historical work module, operation costs module and condition appraisal module. Figures 1 to 3 are windows of the asset register module.

Referring to Figure 1 there is shown a complex details entry form on a computer monitor (not shown). As can be seen this form requires entry of asset number, asset description, client, client region, year of plan, client category of complex usage, construction year, occupancy (number of people using the complex), remote factor, budget and attached complexes.

The form also has graphic images of the site plan, site picture and client's logo.

In Figure 2 the data entry form is for details of a building of the complex. The form requires entry of asset number, asset description, client category of building usage, asbestos system, capital value, construction year, total area and structural type.

Figure 3 shows the details of a complex. The assets currently out of the window area can be moved into the window by scrolling and the details out of the window area can be viewed by panning left or right of the window.

Any of the assets of the complex in the Figure 3 window can be selected for further action in any of the 5 modules.

The work order entry form as shown in Figure 5 requires entry of scheduled frequency of service. This is used for a 10 year maintenance plan which will be described later.

The form in Figure 5 shows that the entered asset is ranked 140. The ranking is determined in accordance with the formula:

Prioritisation score = (A + B) * C

In this case A = 10 as it is assessed as N or "Other than the above", B = 5 and C = 3. The system of the present invention use the values of A, B and C to general the score of 30 which is ranked in position 140 in a list of prioritise maintenance service. Examples of the list is shown in Figures 15 and 16.

The historical work module when selected presents an entry form as shown in Figure 5 for data entry. As indicated the maintenance services are categorised into breakdown, incident response and routine.

The system of the present invention also has a entry form for operation costs (see Figure 6).

The appraisal data entry form shown in Figure 7 is for entering appraisal details made by assessors. As can be seen the building condition is rated optimal or 0 by the formula:

$$Building\ condition = \sum \frac{(B_n - a)}{n}$$

and in this case $B_n = 3$ and $a = 3$ as indicated in the figure.

The system of the present invention also has a task data entry form as shown in Figure 8. This form is for entering task required following appraisal.

Figure 9 shows flow diagram in which the system of the present invention is linked with a word processing application program.

In the example of Figure 9 the a view document option is selected from the window in Figure 3. The system starts the application program automatically and open a path between the system and the application program. When started the application uses a template document and insert client's logo and site photo in the appropriate positions in the document. Details of the asset for viewing are also imported from a database in a remote file server and from the data storage of the system. This example requires presentation of bar diagrams and the diagram generation module is shown in Figure 10.

Figure 11 to 13 shown a summary of condition index, current condition index relative to other assets and 10 year condition index relative to other index.

Figure 14 is a table including building usage nominated by the client and assessors condition ratings.

Figures 15 and 16 are respectively the current year prioritisation list and the following year prioritisation list.

Figure 17 is a table of the costs of planned services for the complex over 10 years.

Turning to Figure 18 there is shown a module selection menu for another embodiment of the system according to the present invention. The modules include "asset register" for registering and editing asset details, "condition assessment planning" for specifying conditions for assessment of elements, groupings of elements, assets, and groupings of assets, "condition assessment delivery" for delivering assessment reports, and other modules as shown.

Figures 19 to 24 a hieracharachical tree structure for selecting regions, complexes, buildings, levels of buildings, element groups, and elements; forms for entering details of conditions of elements, and indications of assessed conditions, for the condition assessment planning module.

Referring to Figure 19 there is shown a window having assessed condition details for a switch board element in a workshop of Alderley Police Department in Queensland. This form indicates that the desired condition rating is 5 and the assessed condition is 3. It also includes a description of conditions of the switch board.

Tabs are provided for selecting forms for accessing asset details, assessment conditions, defect details, allocating tasks, history, reports, and condition index. Tabs are also provided foe adding , editing and deleting details.

When the "Defects" tab is selected the form shown in Figure 20 is presented for accessing defect details for the switch board and to calculate its maintenance ranking.

Selection of the "Tasks" tab allows an assessor to retrieve a etailed description of the task, time for carrying out the task and costing for the task., as shown in Figure

21.

Figure 22 shows a window presented as a result of selecting the "condition index" tab. In this case the condition index as indicated is for all elements in the "Electrical Services" grouping. Figure 23 shows the condition index for the workshop, and Figure 24 shows that for the police department.

The processing means uses certain weightings shown in following table to calculate the assessed condition of the element group "ELECTRICAL SERVICES".

Subordinate Assets	CRITICALITY	Weighting (W)	Assessed Condition (out of 5)	Weighting x Condition
Internal Electrical Reticulation	Very High	9	3	27
Internal Generators	Very High	9	4	36
Emergency Lighting	Very High	9	3	27
General Lighting	High	8	3	24
Switchboards	Critical	10	2	20
UPS Systems	Critical	10	5	50
Energy Management System	High	8	4	32
Bldg Services Management System	Very High	9	4	36
Heaters/Fans unducted	High	8	4	32
Lightning protection	Very High	9	4	36
	∑ Total	**89**		**320**

Table 4 – Data table for Calculating Assessed Condition of Electrical Services

Therefore the Assessed Condition of *ELECTRICAL SERVICES* = 320 / 89 = **3.6** *(out of 5)

**rounded to one decimal place*

A specified condition can be calculated by the same method.

Note, the asset class ELEMENT has no subordinates and therefore its condition is manually input not calculated. Possible ELEMENT condition values range from 0.0 to 5.0 (in 0.5 increments eg. 3.5). The condition of each asset in the classes ELEMENT GROUP, BUILDING, or COMPLEX is calculated using the aggregated average of the weighted resultant (calculated) condition of the asset level below it in the asset class hierarchical structure shown in Table 1.

The maintenance ranking calculation process can be illustrated as follows:

For example, on 1 December 2000 a switchboard was inspected and found to be severely overloaded, with signs of excessive heating of wiring in some circuits. The assessor has recommended the switchboard to be upgraded to a larger size.

The assessor then enters details into the system according to the present invention in order to calculate a maintenance ranking and estimate the time by when this task should be addressed.

For the task the following values are entered:

Criticality of the Element Switchboard =	Critical
Criticality of the Element Group Electrical Services =	Very High
Specified Condition of the Element Switchboard =	5 (out of 5)
Assessed Condition of the Element Switchboard =	3 (out of 5)

Risk Factor relating to the potential impact of the defect = Very High

Current Business Operations Impact of the defect = Interruptions

Therefore, from the above tables, the following values are used:

(W_{BL}) = 10

(W_{EG}) = 8

(SC) = 5

(AC) = 3

(RF) = 20

(BOI) = 8

The primary algorithm is:

Maintenance Ranking = $10 \times \sqrt{\{ f(BOI, RF, SC, AC) \times \sqrt{(W_{BL} \times W_{EG})} \}}$

f(BOI, RF, SC, AC) needs to be calculated. For the calculation this can be simplified to f(BOI, RF, SC, AC) = f(BOI, RF, ΔC) = BOI x RF x f(ΔC)

RF = 20

BOI = 8

Using Table 11 RF x BOI = 20 x 8 = 160 and falls into Zone A.

ΔC = SC – AC = 5 – 3 = 2.0 This corresponds to a value of 4 (see Table 10)

Using Table 13, a value of 4 in zone A corresponds to a value of f(ΔC) = 4.75

Therefore BOI x RF x f(ΔC) = 8 x 20 x 4.75 = 760

Now considering the other part of the equation $\sqrt{(W_{BL} \times W_{EG})} = \sqrt{(10 \times 8)} = \sqrt{(80)} =$ 8.94

Therefore the Maintenance Ranking is:

$10 \times \sqrt{\{ (8 \times 20 \times 4.25) \times \sqrt{(10 \times 8)} \}} = 824$

Rounded up to the nearest 5, this equates to a value of 825.

Using Table 14, this corresponds to a Timeframe of 6 months. Therefore, the "notional" start date for the upgrade of the switchboard should take place within 1 December 2000 + 6 months

=1 June 2001.

Maintenance Ranking = 825

Recommended Timeframe = 1 June 2001.

Whilst not shown, it should be understood that the condition index and the maintenance rankings can be indicated in a table form and/or graphically .

Whilst the above has been given by way of illustrative example of the present invention many variations and modifications thereto will be apparent to those skilled in the art without departing from the broad ambit and scope of the invention as herein set forth.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A maintenance management system for one or more assets of an organisation, the system comprising input means for entering data relating to a set of characteristics of the one or more assets, data storage means for storing the entered data, processing means adapted for processing selected data in said storage means to provide a listing of maintenance services for the assets in accordance with a priority determining arrangement.

2. The system according to claim 1 wherein the listing includes a prioritised list of maintenance services for the or each asset.

3. The system according to claim 2 wherein the prioritised list of maintenance services is based on maintenance rankings of calculated prioritisation maintenance services.

4. The system according to any one of claims 1 to 3 the listing includes a list of asset conditions for the or each asset.

5. The system according claim 4 said list of asset conditions is indicated as an index.

6. The system according to claim 4 or 5 wherein the list of asset conditions is based on averaging weights allocated to elements of assets.

7. The system according to any one of claims 1 to 6 wherein the or each asset including a plurality of elements and the set of characteristics of the one or more assets includes characteristics of the elements in the or each asset.

8. The system according to claim 7 wherein the element characteristics including asset usage data, element condition data, element performance data, risk exposure data and service effect data.

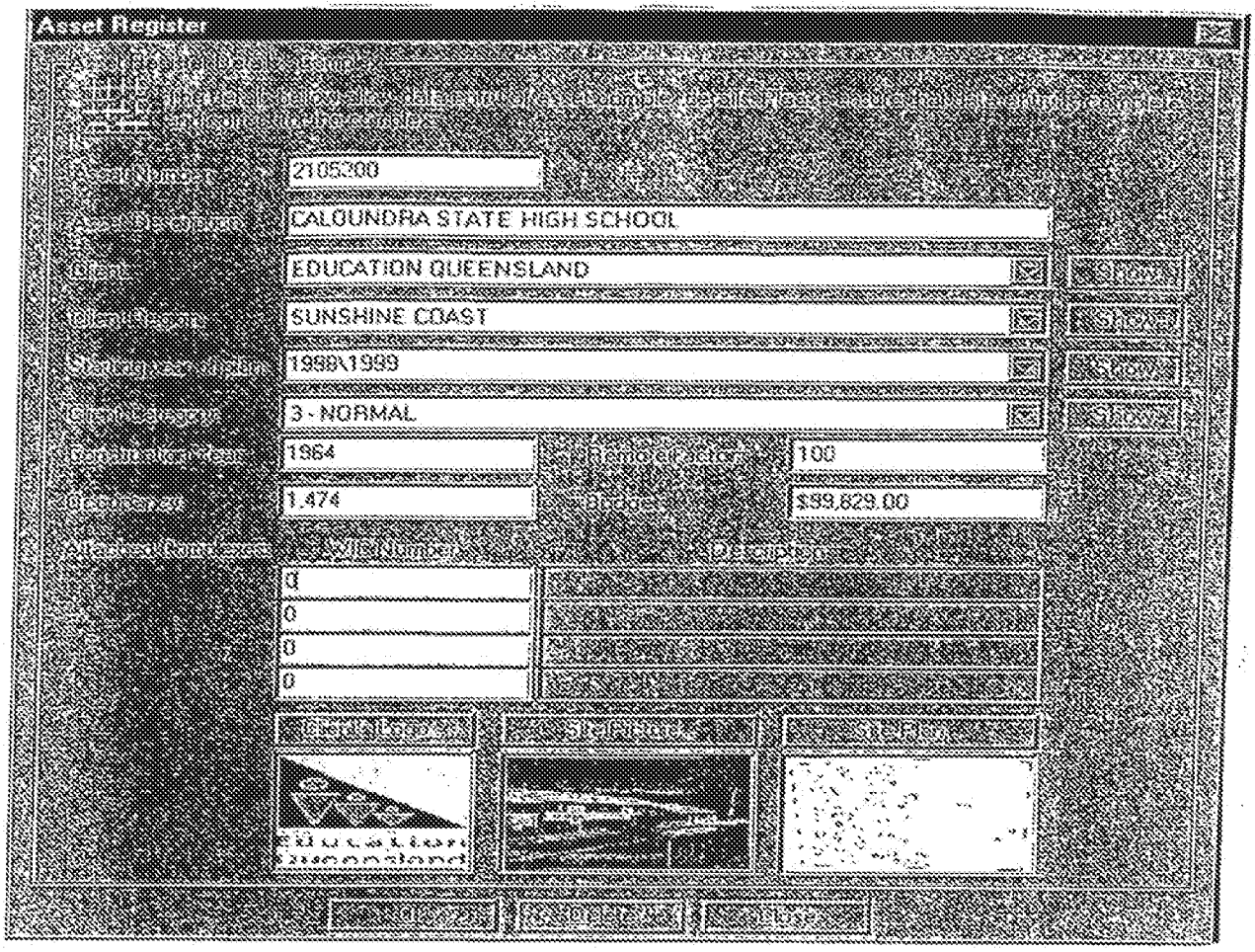
9. The system according to claim 7 wherein the set of characteristic including maintenance cost data for the or each asset for providing a table indicating the respective costs of the maintenance services.

10. The system according to claim 8 or 9 wherein the set of characteristics including capital cost data for providing a comparison of the maintenance costs and the capital costs.

11. The system according to any one of claims 8 to 10 wherein the set of characteristics including frequency of services data so that projected maintenance costs over a period of time can be provided.

DATED this 20th day of DECEMBER 2000

DEPARTMENT OF PUBLIC WORKS AND HOUSING
By their Patent Attorneys
INTELLPRO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CALOUNDRA STATE HIGH SCHOOL
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SUNSHINE COAST
1998\1999
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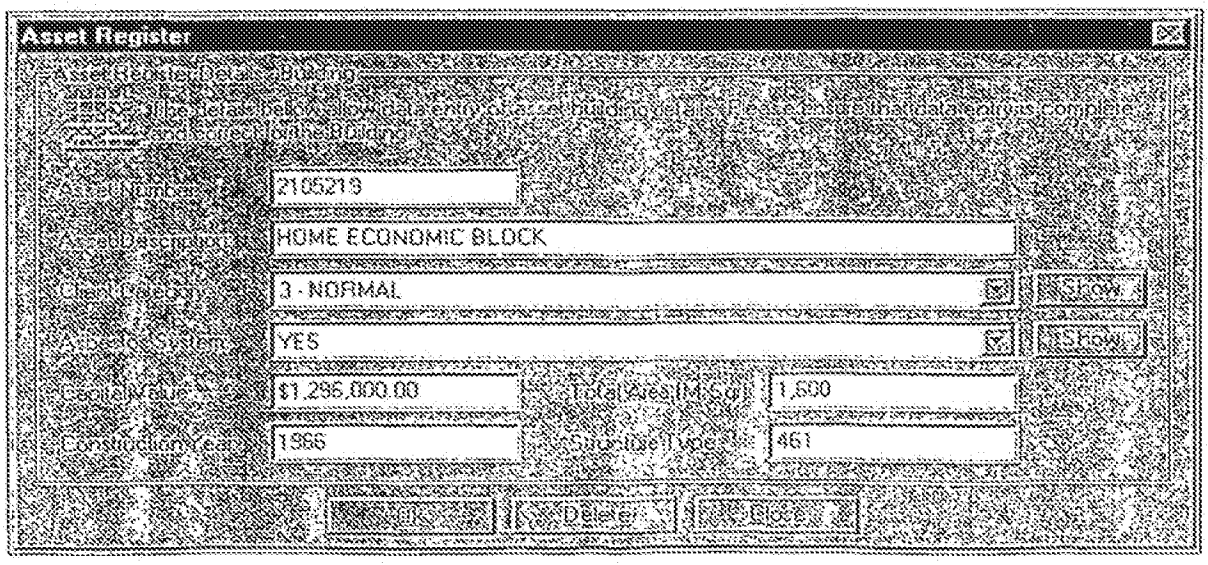
FIG 1


Asset Register
2105219
HOME ECONOMIC BLOCK
3 - NORMAL
YES
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1,600
1966
461

FIG 2

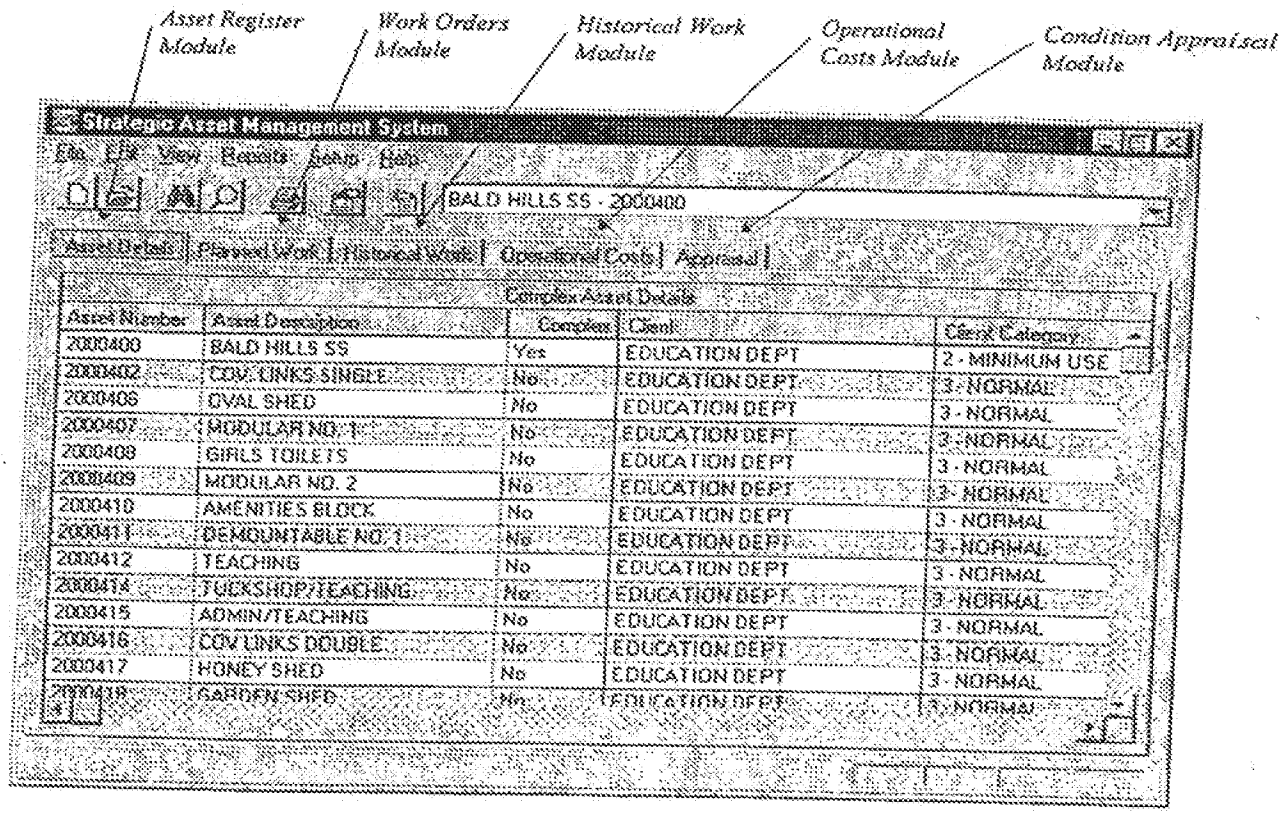

Asset Register Module
Work Orders Module
Historical Work Module
Operational Costs Module
Condition Appraisal Module
Strategic Asset Management System
File Edit View Reports Jump Help
BALD HILLS SS - 2000400
Asset Details | Planned Work | Historical Work | Operational Costs | Appraisal
Complex Asset Details
Asset Number | Asset Description | Complex | Client | Client Category
2000400 | BALD HILLS SS | Yes | EDUCATION DEPT | 2 - MINIMUM USE
2000402 | COV. LINKS SINGLE | No | EDUCATION DEPT | 3 - NORMAL
2000406 | OVAL SHED | No | EDUCATION DEPT | 3 - NORMAL
2000407 | MODULAR NO. 1 | No | EDUCATION DEPT | 3 - NORMAL
2000408 | GIRLS TOILETS | No | EDUCATION DEPT | 3 - NORMAL
2000409 | MODULAR NO. 2 | No | EDUCATION DEPT | 3 - NORMAL
2000410 | AMENITIES BLOCK | No | EDUCATION DEPT | 3 - NORMAL
2000411 | DEMOUNTABLE NO. 1 | No | EDUCATION DEPT | 3 - NORMAL
2000412 | TEACHING | No | EDUCATION DEPT | 3 - NORMAL
2000414 | TUCKSHOP/TEACHING | No | EDUCATION DEPT | 3 - NORMAL
2000415 | ADMIN/TEACHING | No | EDUCATION DEPT | 3 - NORMAL
2000416 | COV LINKS DOUBLE | No | EDUCATION DEPT | 3 - NORMAL
2000417 | HONEY SHED | No | EDUCATION DEPT | 3 - NORMAL
2000418 | GARDEN SHED | No | EDUCATION DEPT | 3 - NORMAL

FIG 3

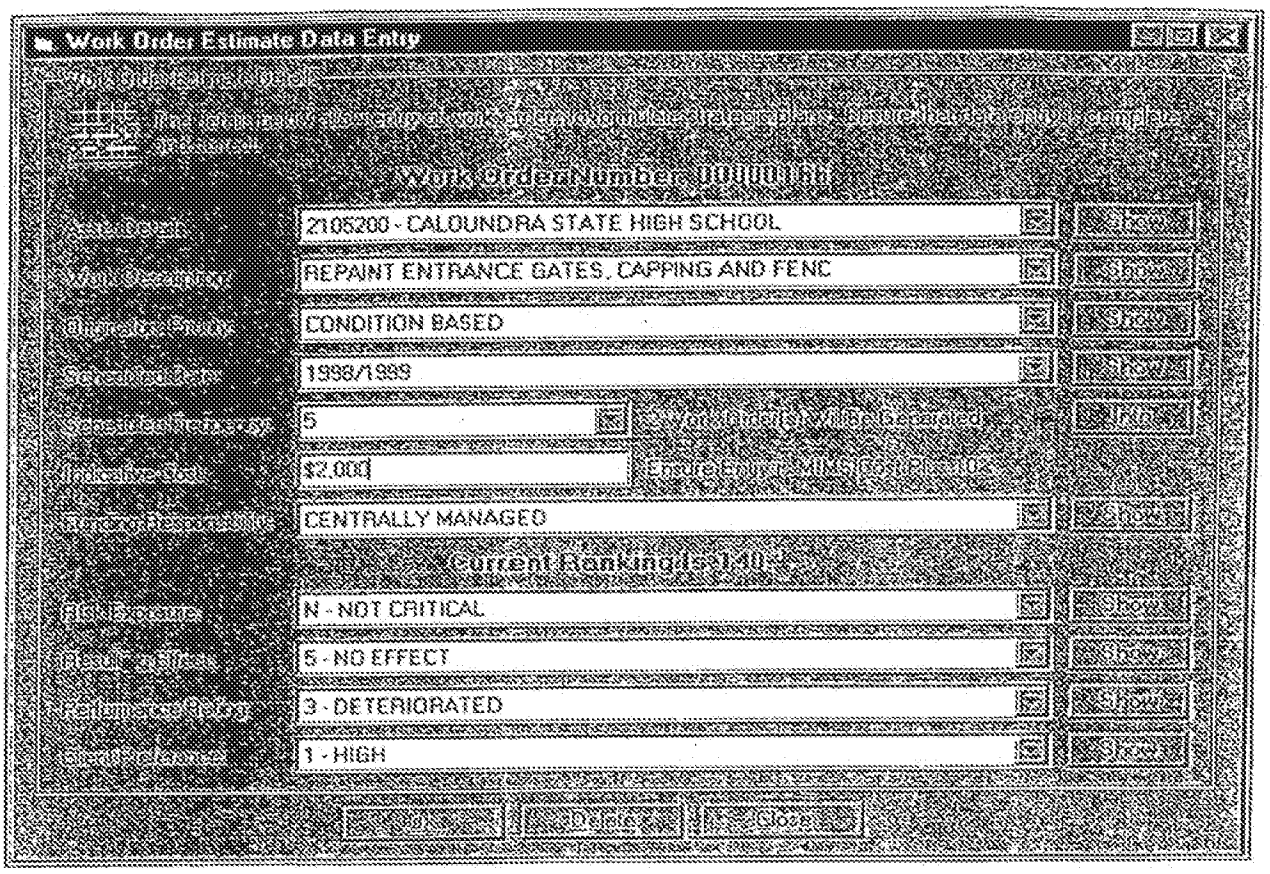

Work Order Estimate Data Entry
Work Order Number 00000184
2105200 - CALOUNDRA STATE HIGH SCHOOL
REPAINT ENTRANCE GATES, CAPPING AND FENC
CONDITION BASED
1998/1999
5
$2,000
CENTRALLY MANAGED
N - NOT CRITICAL
5 - NO EFFECT
3 - DETERIORATED
1 - HIGH

FIG 4

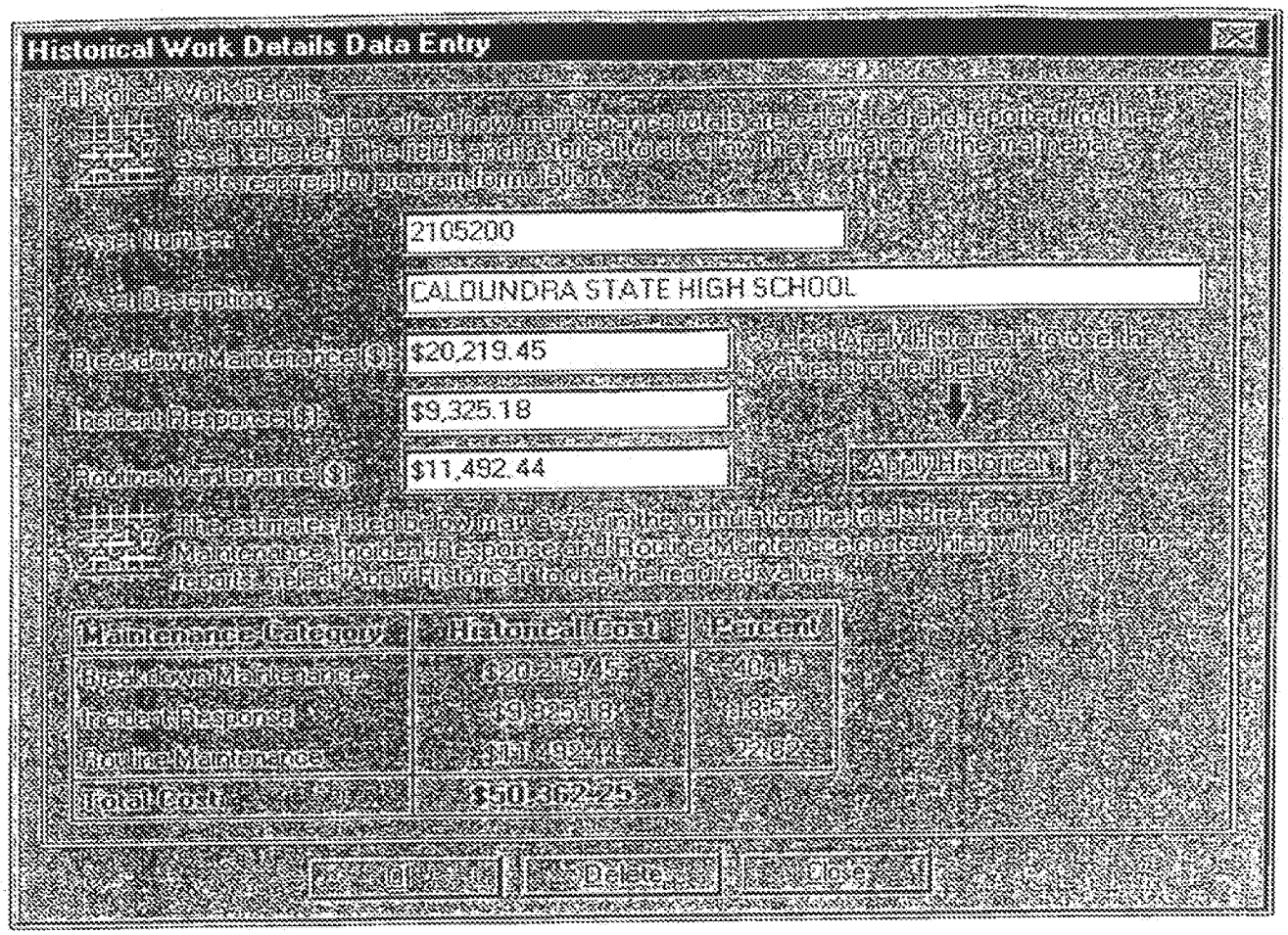

Historical Work Details Data Entry
Historical Work Details
Asset Number
2105200
Asset Description
CALOUNDRA STATE HIGH SCHOOL
Breakdown Maintenance ($)
$20,219.45
Incident Response ($)
$9,325.18
Routine Maintenance ($)
$11,492.44
Apply Historical
Maintenance Category
Historical Cost
Percent
Breakdown Maintenance
$20,219.45
40.05
Incident Response
$9,325.18
18.52
Routine Maintenance
$11,492.44
22.82
Total Cost
$50,362.25
Save
Delete
Close

FIG 5

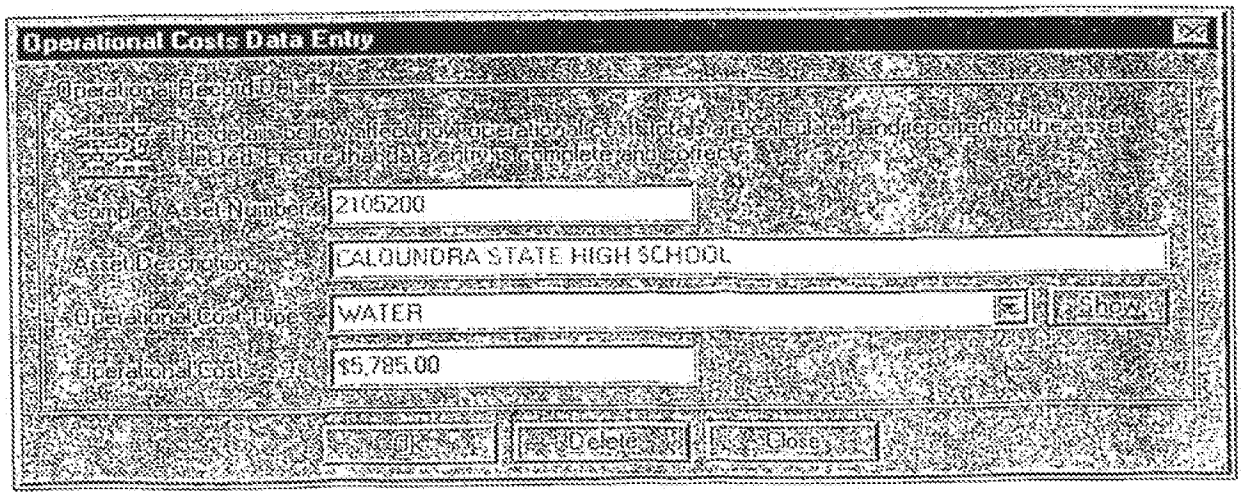

Operational Costs Data Entry
Operational Cost Details
Complex Asset Number
2105200
Asset Description
CALOUNDRA STATE HIGH SCHOOL
Operational Cost Type
WATER
Show
Operational Cost
$5,785.00
Save
Delete
Close

FIG 6

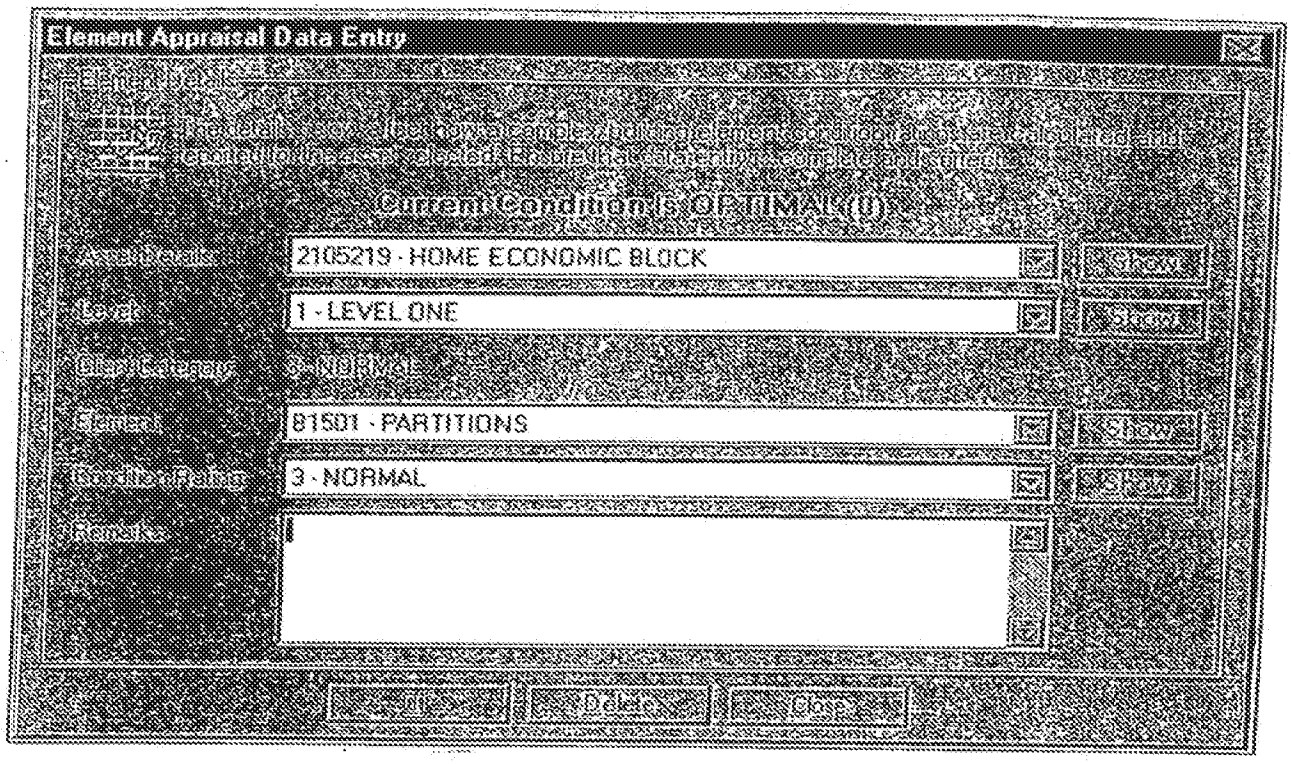

Element Appraisal Data Entry
Current Condition is OPTIMAL(1)
21105219 - HOME ECONOMIC BLOCK
1 - LEVEL ONE
3 - NORMAL
81501 - PARTITIONS
3 - NORMAL
Show
Add
Delete
Close

FIG 7

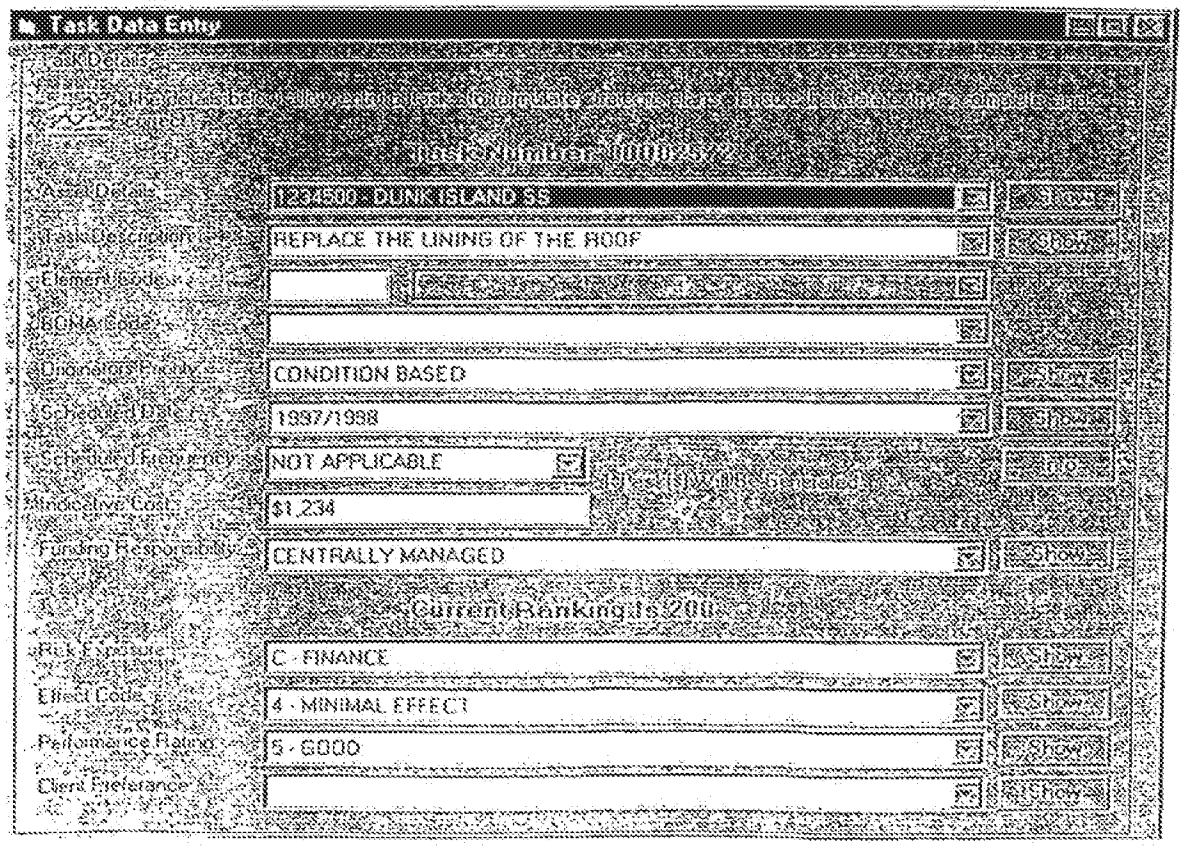

Task Data Entry
1234500 - DUNK ISLAND SS
REPLACE THE LINING OF THE ROOF
CONDITION BASED
1997/1998
NOT APPLICABLE
$1,234
CENTRALLY MANAGED
C - FINANCE
4 - MINIMAL EFFECT
5 - GOOD
Show

FIG 8

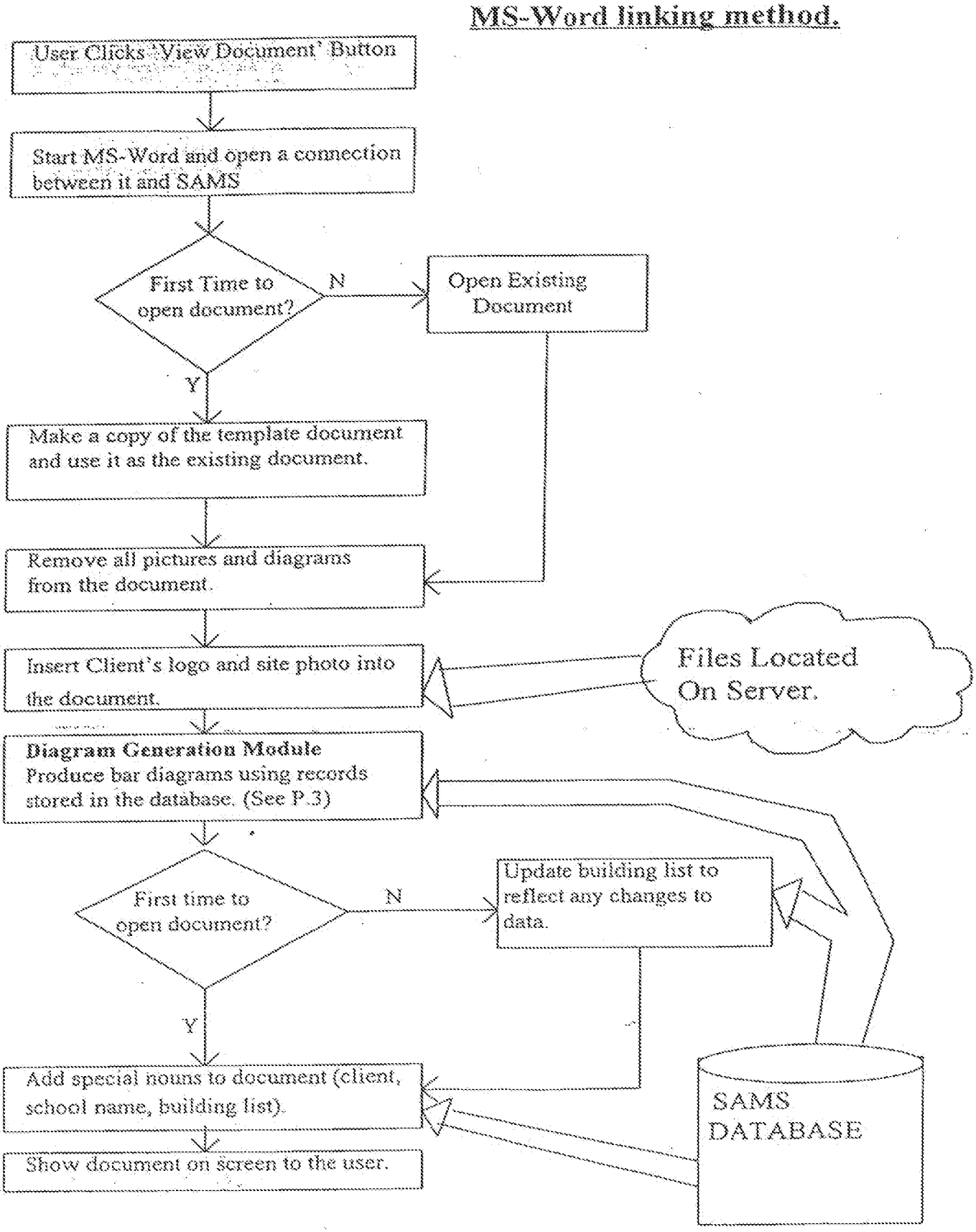

MS-Word linking method.
User Clicks 'View Document' Button
Start MS-Word and open a connection between it and SAMS
First Time to open document?
N
Open Existing Document
Y
Make a copy of the template document and use it as the existing document.
Remove all pictures and diagrams from the document.
Insert Client's logo and site photo into the document.
Files Located On Server.
Diagram Generation Module
Produce bar diagrams using records stored in the database. (See P.3)
First time to open document?
N
Update building list to reflect any changes to data.
Y
Add special nouns to document (client, school name, building list).
Show document on screen to the user.
SAMS DATABASE

FIG 9

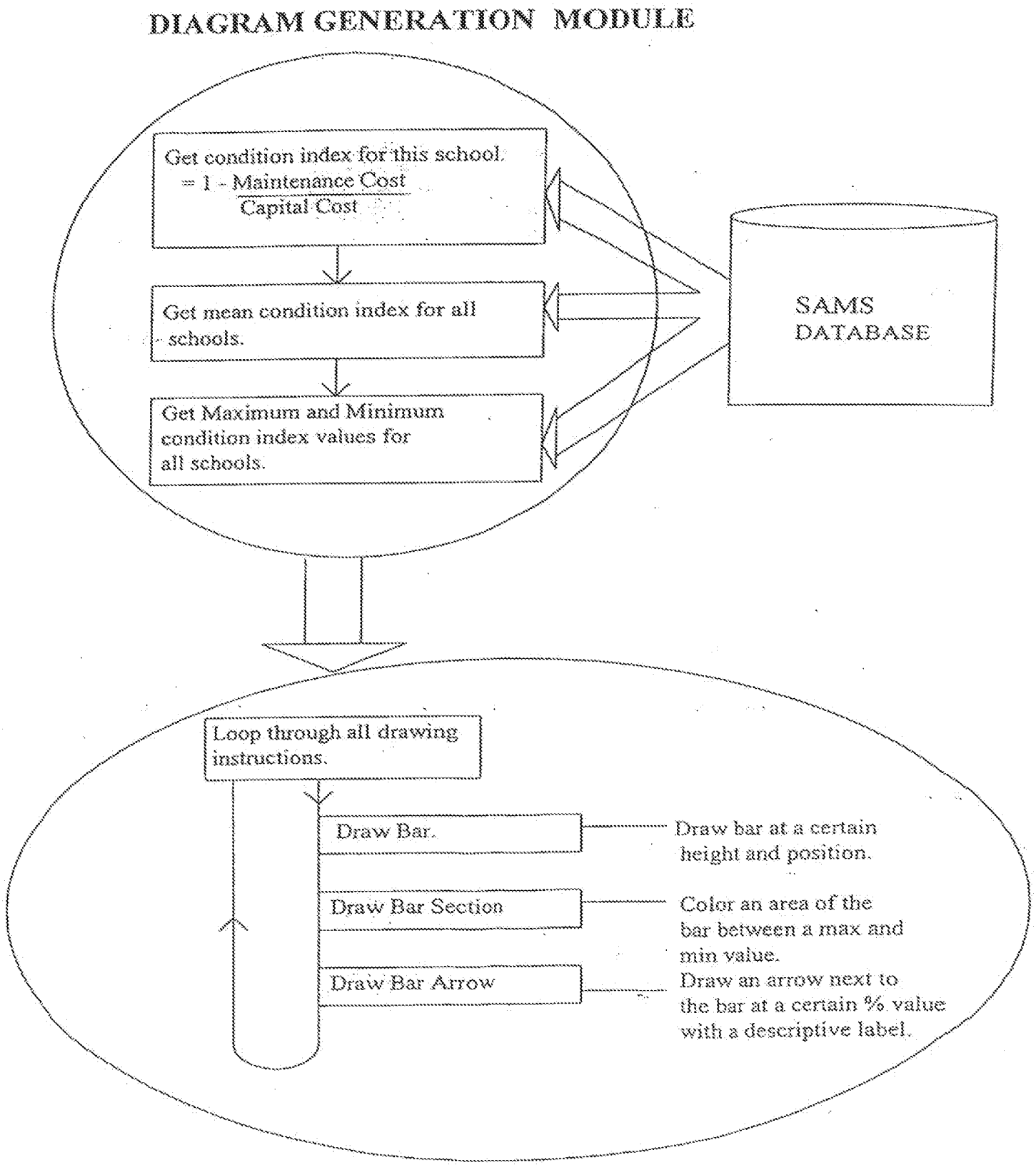


DIAGRAM GENERATION MODULE
Get condition index for this school.
= 1 - Maintenance Cost / Capital Cost
Get mean condition index for all schools.
Get Maximum and Minimum condition index values for all schools.
SAMS DATABASE
Loop through all drawing instructions.
Draw Bar.
Draw bar at a certain height and position.
Draw Bar Section
Color an area of the bar between a max and min value.
Draw Bar Arrow
Draw an arrow next to the bar at a certain % value with a descriptive label.

FIG 10

FIG 11

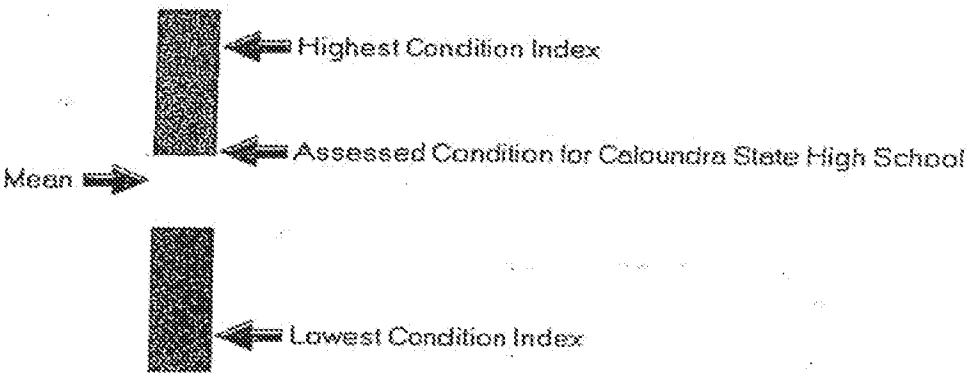


FIG 12

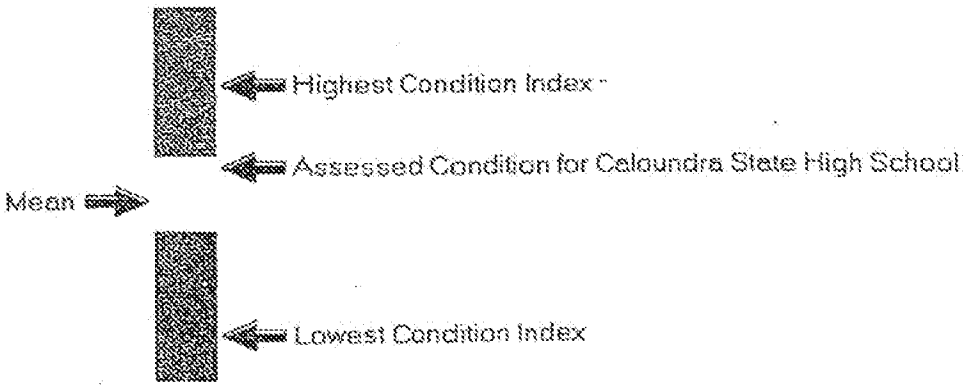


FIG 13

Building Name	WIC Building No.	Client's Required Building Rating	Commuted Building Rating Relative To The Client's Rating	Number of Identified Condition Based Maintenance Projects	Total Value of Condition Based Maintenance Projects
SITE	2105200	3	0 (optimum)	21	$182,050
ADMINISTRATION BLOCK	2105201	3	0 (optimum)	7	$149,180
BUS SHELTER & POTTERY	2105202	3	0 (optimum)	2	$3,200
COVERED LINKS	2105203	3	0 (optimum)	3	$32,000
MULTI PURPOSE SHELTER	2105204	3	0 (optimum)	3	$75,600
TOILET AMENITIES (NEAR BLK D)	2105205	3	0 (optimum)	4	$10,300
MODULAR 4	2105209	3	0 (optimum)	7	$16,595
MODULAR 3	2105210	3	0 (optimum)	5	$21,175
MODULAR 2	2105211	3	0 (optimum)	5	$19,845
MODULAR 1	2105212	3	0 (optimum)	5	$23,975
MUSIC BLOCK	2105213	3	0 (optimum)	4	$34,280
COMMUNICATIONS BLOCK	2105214	3	0 (optimum)	12	$119,400
ART FACULTY	2105215	3	0 (optimum)	1	$5,040
LIBRARY BLOCK	2105216	3	0 (optimum)	6	$58,200
SCIENCE BLOCK	2105217	3	0 (optimum)	8	$46,100
FIRST YEAR CENTRE	2105218	3	0 (optimum)	4	$41,400
HOME ECONOMIC BLOCK	2105219	3	0 (optimum)	12	$193,200
TEACHING BLOCK F	2105220	3	0 (optimum)	9	$103,260
SCIENCE BLOCK E	2105221	3	0 (optimum)	6	$31,500
SERVICES TOILET BLOCK D	2105222	3	0 (optimum)	4	$28,260
MANUAL ARTS BLOCK C	2105223	3	0 (optimum)	10	$139,600
SPORTS & STORAGE	2105224	3	0 (optimum)	1	$6,000
TRACTOR & STORAGE	2105225	3	0 (optimum)	1	$1,220
SCIENCE	2105226	3	0 (optimum)	6	$118,980
PERFORMING ARTS	2105227	3	+1 (above rating)	3	$25,200
STUDENT COVERED AREA	2105228	3	+1 (above rating)	2	$5,600
MODULAR 5	2105229	3	0 (optimum)	5	$10,400
MODULAR 6	2105230	3	0 (optimum)	5	$11,940
AMENITIES BLOCK (NEAR MUSIC)	2105231	3	+1 (above rating)	2	$5,000
Totals:					$1,608,200

FIG 14

Building Name	WICBuilding No.	Description of Work	Computed Project Score	Client Priority	Indicative Cost
SITE (CALOUNDRA SHS)	2105200	RELEVEL PAVERS TO MODULAR8	720 ($)		$4,200
COMMUNICATIONS BLOCK	2105214	REPAIR LATTICE PANELS & SHADE ROOF	720 ($)		$3,000
SITE (CALOUNDRA SHS)	2105200	RELEVEL PAVERS - BUS SHELTER	720 ($)		$3,500
SITE (CALOUNDRA SHS)	2105200	RPL CRACKED PATH BETWEEN G BLOCK & ADMIN	630 ($)		$1,800
COMMUNICATIONS BLOCK	2105214	REPLACE COURTYARD ROOF PURLINS	630 ($)		$900
COMMUNICATIONS BLOCK	2105214	REPLACE ALUMINIUM HAND RAILS	630 ($)		$2,500
MODULAR 3	2105210	REPAIR CEILING PANEL	630 ($)		$800
MANUAL ARTS BLOCK C	2105223	REPLACE SOFFIT - TYPINGSTAFF	630 ($)		$2,200
MODULAR 5	2105229	REPAIR SUB FLOOR TIE DOWN BOLTS	560 ($)		$200
SITE (CALOUNDRA SHS)	2105200	REPLACE STREET LIGHTING (2&1/2"ø POLES)	560 ($)		$1,500
MUSIC BLOCK	2105213	REPLACE ROOF GUTTERING	490		$3,100
SITE (CALOUNDRA SHS)	2105200	RPL SPOON DRAIN- BUS SHELTER	480		$1,500
MODULAR 1	2105212	REPLACE LOUVRES	480		$3,500
MODULAR 4	2105209	REPLACE LOUVRES	420		$2,000
MODULAR 3	2105210	REP VERANDAH FLOOR, JOISTS & TREADS	420		$3,435
MANUAL ARTS BLOCK C	2105223	REPLACE BENCHTOPS	420		$3,400
TEACHING BLOCK F	2105220	REPLACE METAL SHEET TO SUN HOODS	400		$4,200
TEACHING BLOCK F	2105220	REPLACE METAL SHEET TO BAGRACK TOPS	400		$3,800
TEACHING BLOCK F	2105220	REPLACE WINDOW ROLLERS	400		$2,500
SITE (CALOUNDRA SHS)	2105200	RPL TIMBER SEATING TO OUTDOOR AUDITORIUM	350		$2,000
MANUAL ARTS BLOCK C	2105223	REPLACE WALKWAY ROOF	350		$2,200
SITE (CALOUNDRA SHS)	2105200	EROSION CONTROL BTWN MODULARS & OVAL	320		$7,500
MANUAL ARTS BLOCK C	2105223	EXTERNAL REPAINT	320		$20,350
ADMINISTRATION BLOCK	2105201	ENGINEER INSPECT & REPORT ON B-WORK	280		$4,000
COVERED LINKS	2105203	REPLACE BOX GUTTERING - ART BLDG 15-18	280		$2,600
SERVICES TOILET BLOCK D	2105222	REPLACE ROOF, GUTTERING & FASCIA	280		$8,160
MANUAL ARTS BLOCK C	2105223	REPAIR ROTTED BEAM WALKWAY	240		$500
SERVICES TOILET BLOCK D	2105222	EXTERNAL REPAINT	240		$3,200
SERVICES TOILET BLOCK D	2105222	INTERNAL REPAINT	240		$5,600
MODULAR 4	2105209	REPAIR STRUCT BEAM VERANDA CORROSION	210		$450
MANUAL ARTS BLOCK C	2105223	REPLACE CARPET	180		$10,800
SITE (CALOUNDRA SHS)	2105200	RPL CHAIN WIRE TO OUDOOR AUDITORIUM	160		$5,500
MODULAR 3	2105210	EXTERNAL REPAINT	160		$2,850
MODULAR 3	2105210	INTERNAL REPAINT	160		$2,470
MODULAR 2	2105211	EXTERNAL REPAINT	160		$2,850
SITE (CALOUNDRA SHS)	2105200	REPAINT ENTRANCE GATES, CAPPING AND FENC	140		$2,000
COVERED LINKS	2105203	EXTERNAL REPAINT	140		$9,500
MODULAR 1	2105212	EXTERNAL REPAINT	140		$2,850
SITE (CALOUNDRA SHS)	2105200	RPL SPOON DRAIN - SPORT & STORAGE	140		$700
ADMINISTRATION BLOCK	2105201	INTERNAL REPAINT	120		$23,000
MODULAR 1	2105212	INTERNAL REPAINT	120		$2,470
					$168,785

FIG 15

Building Name	WIC Building No.	Description of Work	Computed Project Score	Client Priority	Indicative Cost
SITE (CALOUNDRA SHS)	2105200	REPLACE WATER MAIN	640		$79,000
HOME ECONOMIC BLOCK	2105219	REPLACE BIRD PROOFING TO SOFFITS	640		$1,500
SITE (CALOUNDRA SHS)	2105200	RE-LAY PAVERS BETWEEN AMENITIES & BLK C	630	(3)	$3,000
SITE (CALOUNDRA SHS)	2105200	RPRS TO PAVERS - COMMUNICATIONS BLK	630	(3)	$2,000
COMMUNICATIONS BLOCK	2105214	PART REPLACE GUTTERING AND DOWN PIPES	580		$1,500
SCIENCE BLOCK	2105217	RPL SWITCHBOARD	560	(3)	$2,000
COMMUNICATIONS BLOCK	2105214	REPLACE SECTIONS OF ROOF SHEETING	480		$2,000
COMMUNICATIONS BLOCK	2105214	REFIX ROOF FLASHINGS	480		$1,500
MUSIC BLOCK	2105213	REPLACE CARPET	420		$10,710
COVERED LINKS	2105203	REPLACE ROOF SHEET - BLK A/B/ TOILETS	420		$10,400
SITE (CALOUNDRA SHS)	2105200	RPL PAVING WITH CONCRETE (END OF LIB)	400		$3,700
SITE (CALOUNDRA SHS)	2105200	RPL PAVING EAST BND ARTS FAC TO BUS SHLT	400		$3,200
COMMUNICATIONS BLOCK	2105214	REPLACE CARPET	400		$20,000
SCIENCE BLOCK	2105217	SEAMLESS FLOORING	360		$13,300
SITE (CALOUNDRA SHS)	2105200	RESURFACE BITUMEN DRIVEWAY	350		$6,750
SITE (CALOUNDRA SHS)	2105200	RESURFACE BIT PARADE BETWN ADMIN & A	350		$3,900
SITE (CALOUNDRA SHS)	2105200	RPL RETAIN WALL WITH CRIBB WALL(COM BLK)	350		$24,000
LIBRARY BLOCK	2105216	REPLACE SOFFIT SHEETS	350		$1,500
HOME ECONOMIC BLOCK	2105219	REPLACE METAL HOODS TO HAT & BAG TOPS	320		$6,500
FIRST YEAR CENTRE	2105218	REPLACE GUTTERING (NORTH SIDE)	300		$2,200
SCIENCE BLOCK	2105217	REPLACE ROOF SHEETING	300		$12,000
SITE (CALOUNDRA SHS)	2105200	REPAINT TIMBER SEATS TO OUDOOR AUDITORIUM	240		$7,000
HOME ECONOMIC BLOCK	2105219	REP SHEETING W/WAY OF WITH COMPRESSED FC	240		$1,500
SERVICES TOILET BLOCK D	2105223	REPAIRS TO BRICK WORK	240		$2,500
MULTI PURPOSE SHELTER	2105204	REMOVE REDUNDANT TIMBER SCREEN	210		$1,500
SCIENCE	2105226	REPAINT BENCH TOPS (2 PACK)	210		$1,800
SCIENCE BLOCK E	2105221	EXTERNAL REPAINT	210		$3,400
PERFORMING ARTS	2105227	RECOAT PARQUETRY FLOOR	210		$5,100
MODULAR 2	2105211	REPLACE CARPET	180		$3,150
COMMUNICATIONS BLOCK	2105214	EXTERNAL REPAINT	140		$28,000
ADMINISTRATION BLOCK	2105201	EXTERNAL REPAINT	120		$21,000
MODULAR 3	2105210	REPLACE CARPET	120		$3,150
MODULAR 2	2105211	INTERNAL REPAINT	120		$2,470
HOME ECONOMIC BLOCK	2105219	EXTERNAL REPAINT	120		$20,000
MANUAL ARTS BLOCK C	2105223	INTERNAL REPAINT	120		$12,500
SITE (CALOUNDRA SHS)	2105200	REP CWIRE & RAILS TO FENCE(1 SIN)EAST B	100		$2,500
					$334,130

FIG 16

Life Cycle Maintenance Costs (10 Years)

MAINTENANCE MANAGEMENT PLAN

Complex: Caloundra State High School

INTERNAL REPAINT				$19,000						$19,000
REPLACE CARPET (6 ROOMS)				$11,500						$11,500
REPLACE VINYL					$3,500					$3,500
REPLACE ACCORDIAN DOORS					$4,500					$4,500
REPLACE VERANDAH FLOORING									$20,000	$20,000
REPLACE METAL HOODS TO HAT & BAG TOPS		$6,500								$6,500
REPLACE A/C ROOF SHEETING								$55,000		$55,000
REPLACE CONCRETE COLUMS (12)				$7,000						$7,000
REPLACE BENCH TOPS			$3,200							$3,200
REP SHEETING W/WAY OF WITH COMPRESSED FC		$1,500								$1,500
Yearly Total:	$0	$8,500	$3,200	$37,500	$8,000	$0	$22,000	$55,000	$20,000	$193,200

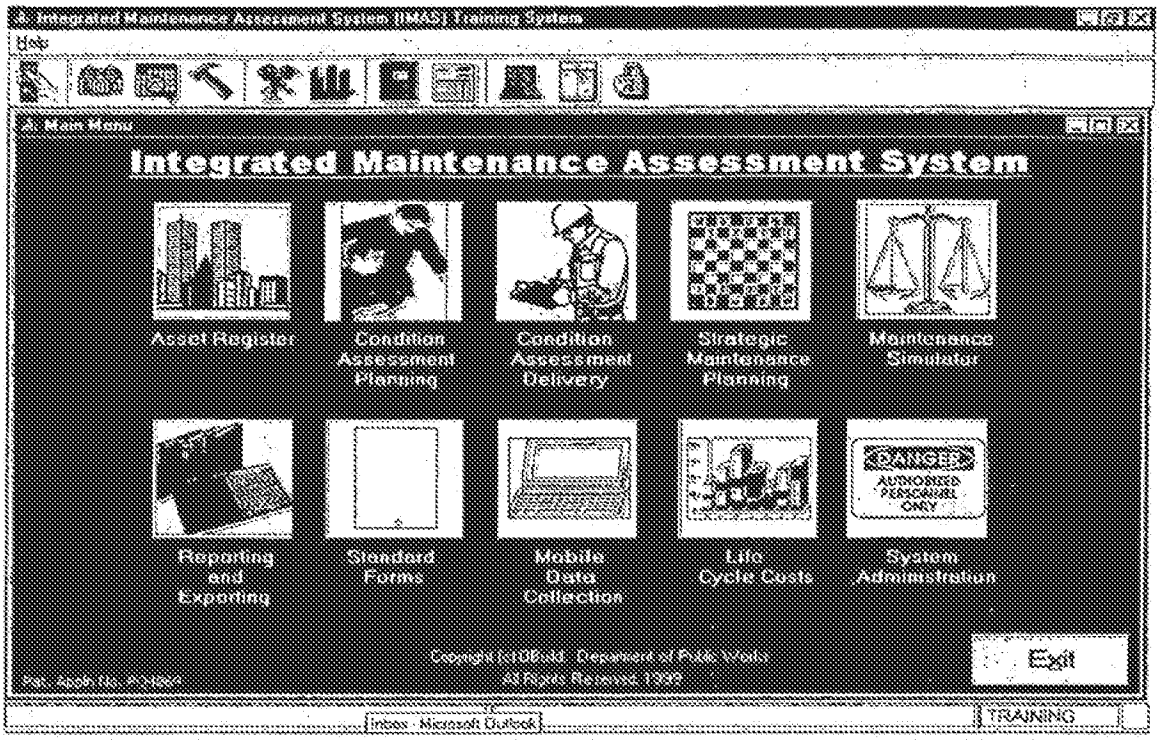
Building Name TEACHING BLOCK F (20)

Description of Work	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	Total
REPLACE VERANDAH FLOOR									$19,000	$19,000
REPLACE METAL SHEET TO SUN HOODS	$4,200									$4,200
REPLACE METAL SHEET TO BAGRACK TOPS	$3,800									$3,800
REPLACE WINDOW ROLLERS	$5,000						$5,000			$5,000
EXTERNAL REPAINT			$27,000					$27,800		$55,800
INTERNAL REPAINT			$19,000							$19,000
REPLACE CARPET			$16,000							$16,000
REPLACE ROOF SHEETING				$33,400						$33,400
REPLACE ROOF GUTTERING				$7,560						$7,560
Yearly Total:	$13,000	$0	$62,000	$40,960	$0	$0	$5,000	$27,800	$19,000	$163,760

Building Name SCIENCE BLOCK E (21)

Description of Work	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	Total

FIG 17



IMAS Main Menu screen

FIG. 18

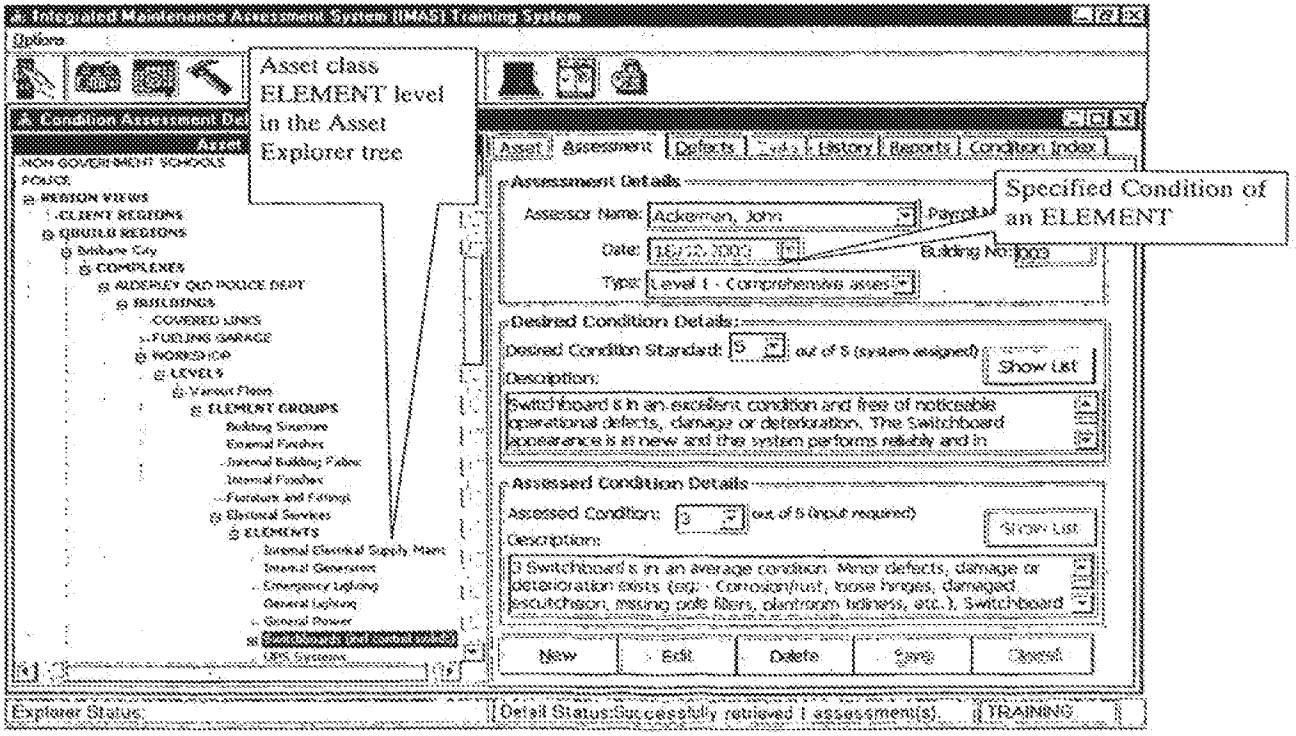


FIG. 19

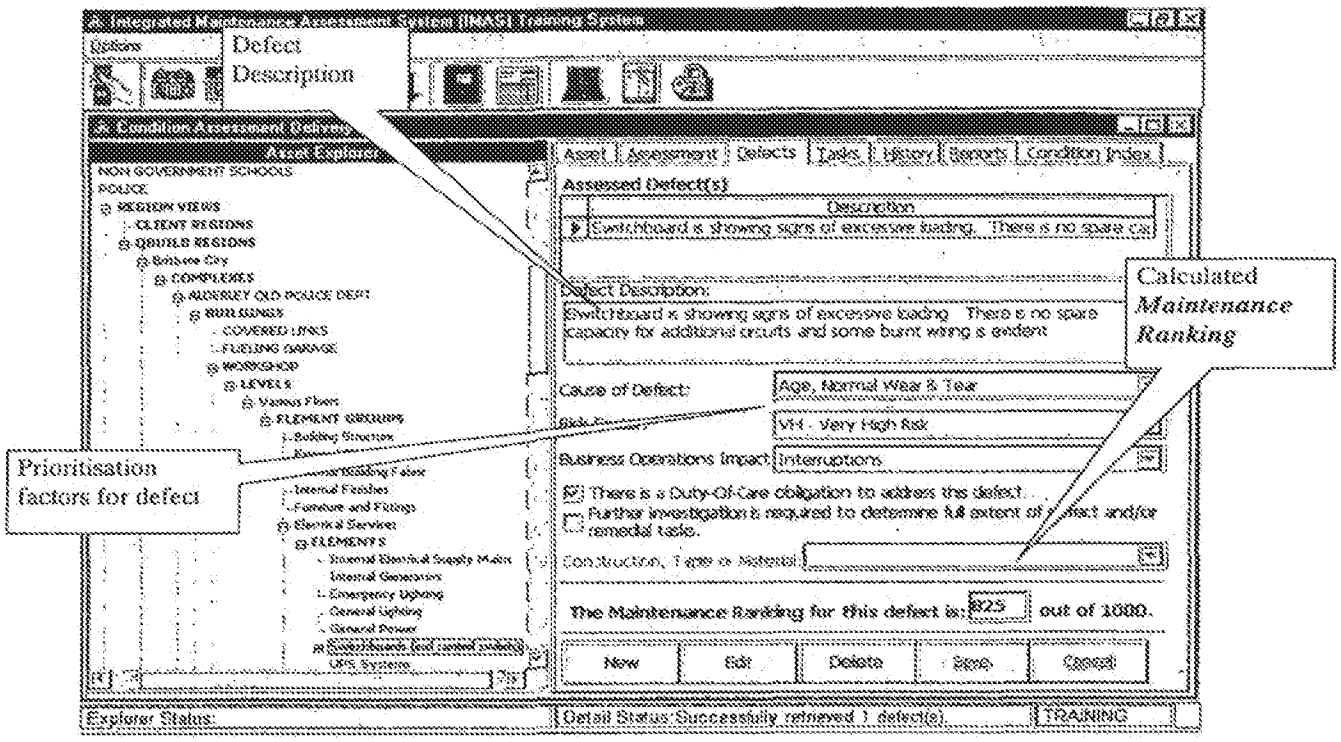

Defect Description
Calculated *Maintenance Ranking*
Prioritisation factors for defect
Cause of Defect:
Age, Normal Wear & Tear
Business Operations Impact:
Interruptions
The Maintenance Ranking for this defect is: 825 out of 1080.
New
Edit
Delete
Save
Cancel

FIG. 20

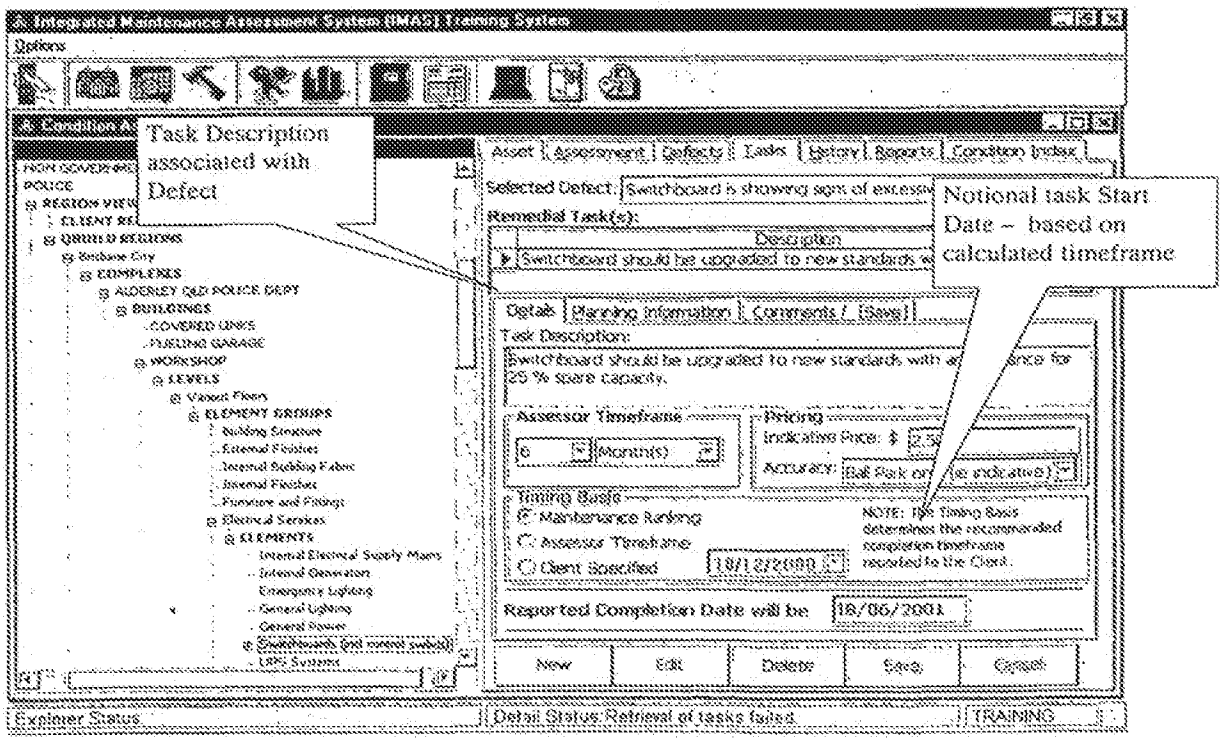

Task Description associated with Defect
Notional task Start Date – based on calculated timeframe
Assessor Timeframe
Maintenance Ranking
Assessor Timeframe
Client Specified
Reported Completion Date will be
New
Edit
Delete
Save
Cancel

FIG. 21

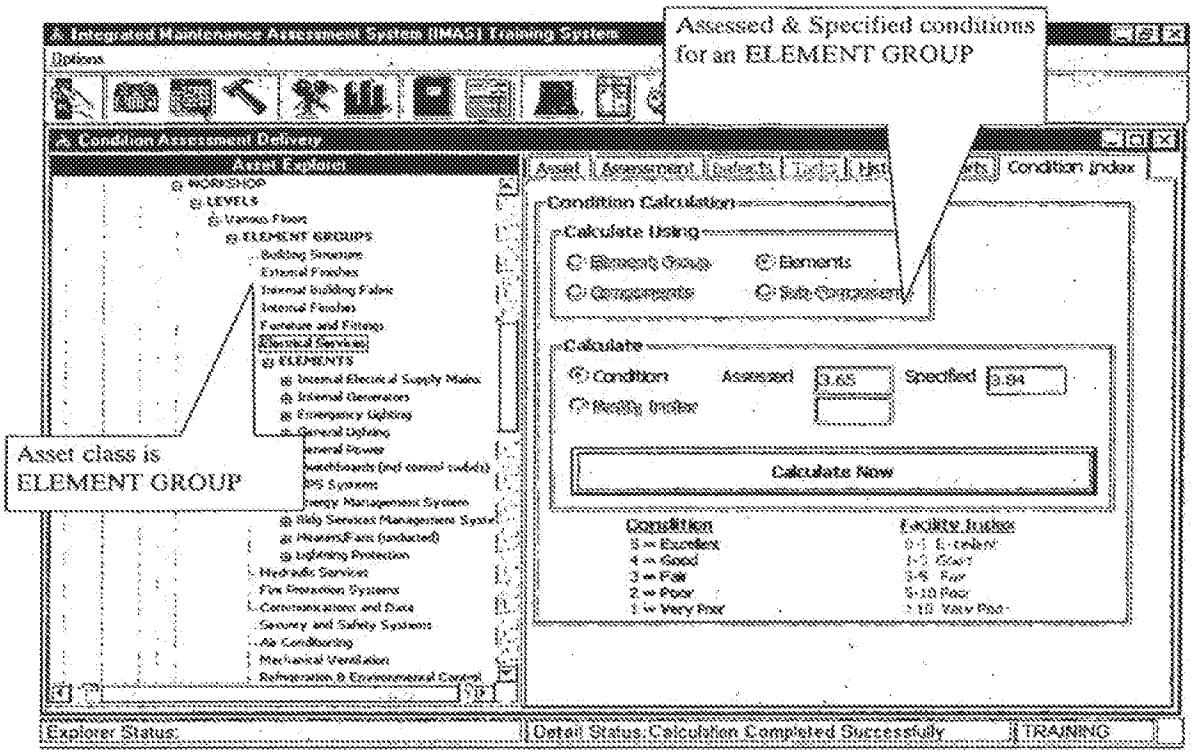

Assessed & Specified conditions for an ELEMENT GROUP
Asset class is ELEMENT GROUP
Condition Assessment Delivery
Asset Explorer
Condition Index
Condition Calculation
Calculate Using
Element Groups
Elements
Components
Sub Components
Calculate
Condition
Assessed
Specified
Facility Index
Calculate Now
Condition
5 = Excellent
4 = Good
3 = Fair
2 = Poor
1 = Very Poor
Facility Index
Explorer Status:
Detail Status: Calculation Completed Successfully
TRAINING

FIG. 22

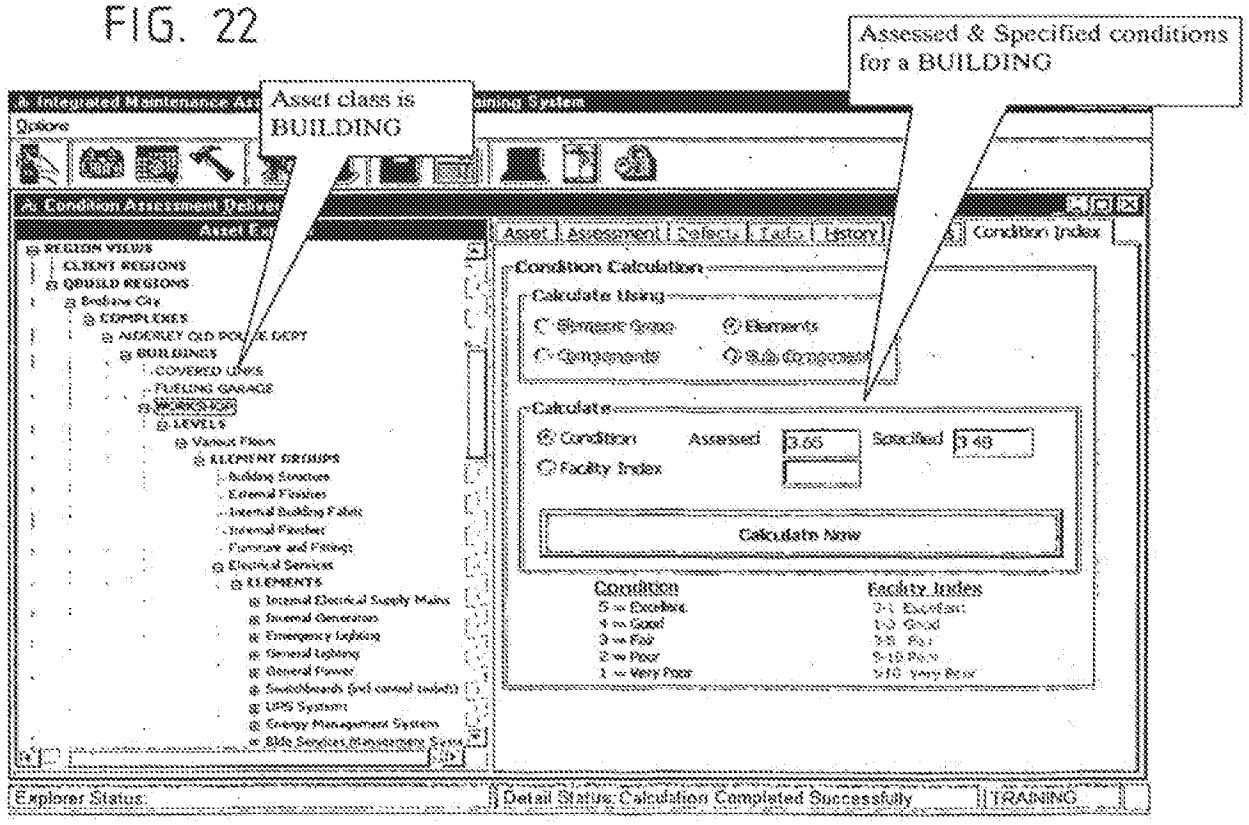

Assessed & Specified conditions for a BUILDING
Asset class is BUILDING
Options
Asset
Assessment
Defects
Tasks
History
Condition Index
Condition Calculation
Calculate Using
Elements
Components
Calculate
Condition
Assessed
Specified
Facility Index
Calculate Now
Condition
Facility Index
Explorer Status:
Detail Status: Calculation Completed Successfully
TRAINING

FIG. 23

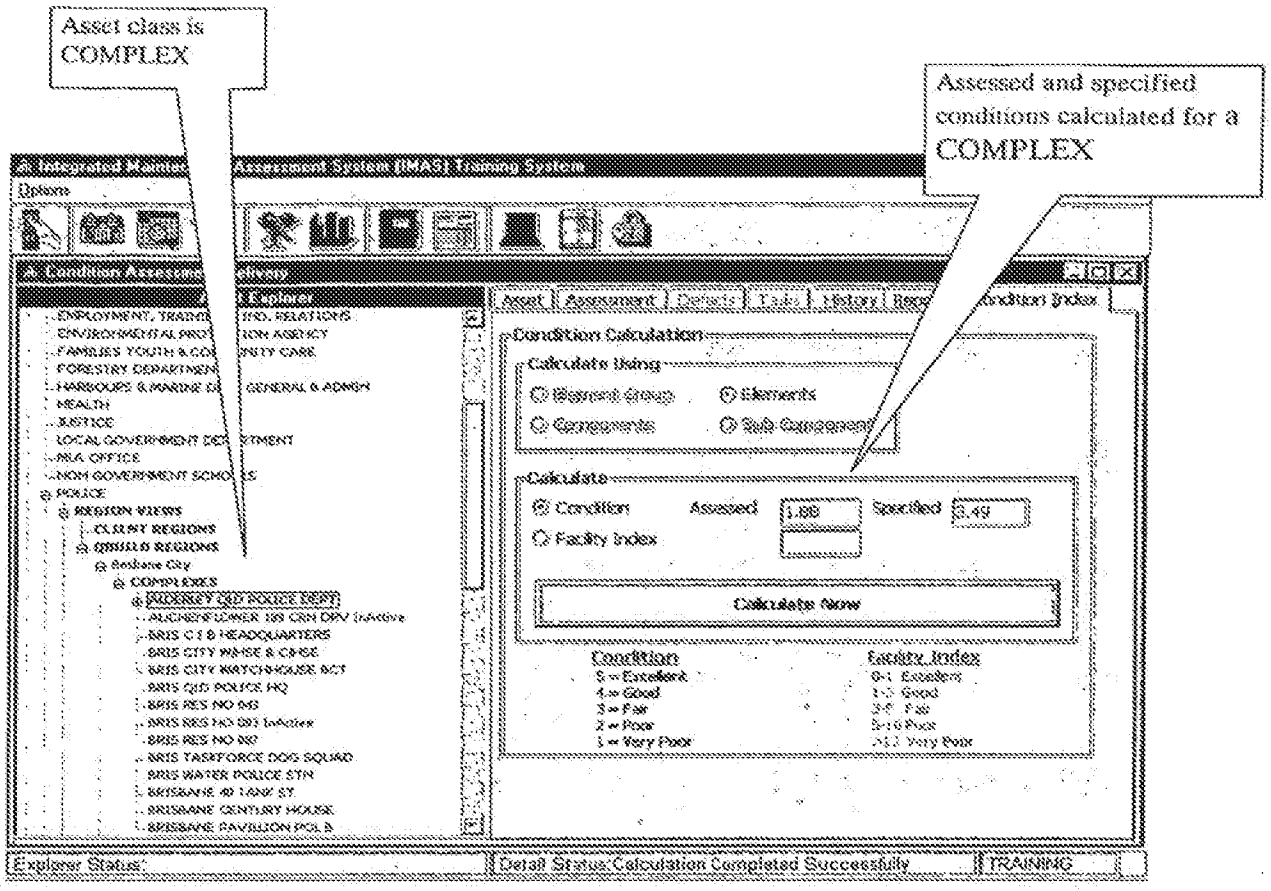

Asset class is COMPLEX
Assessed and specified conditions calculated for a COMPLEX
Condition Calculation
Calculate Using
Calculate
Condition
Assessed
Specified
Facility Index
Calculate Now
Condition
Facility Index
Explorer Status:
Detail Status: Calculation Completed Successfully
TRAINING

FIG. 24